

THE SALZBERG CHEMISTRY SEMINAR SERIES



The City College
of New York



DEPARTMENT OF CHEMISTRY AND
BIOCHEMISTRY – Fall '24

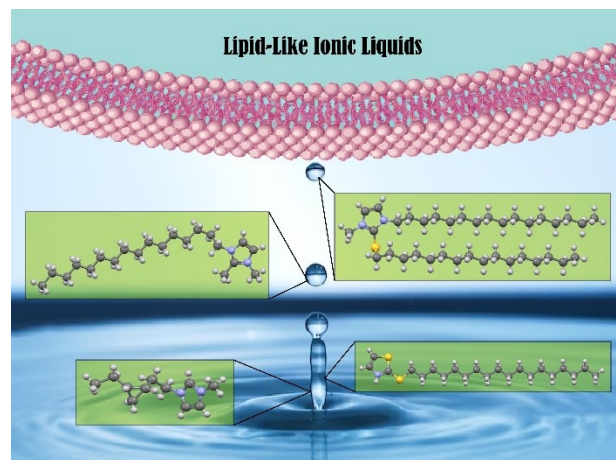
Monday, December 2, 2024 @ 12:00 noon – MR1027

(Dis)solving the World's Problems with Ionic Liquids

Arsalan Mirjafari
Department of Chemistry
SUNY Oswego



Abstract: The success of gene therapy and gene vaccines hinges on the development of vectors that are effective, stable, and safe. While viral vectors exhibit high transfection efficiency, their significant toxicity concerns have spurred the search for safer alternatives. Synthetic cationic lipids have emerged as promising candidates, offering a compelling balance of efficacy and safety. For over a decade, our laboratory has focused on the rational design of lipid-like ionic liquids as a novel class of bio-inspired materials for gene delivery. These compounds, bearing long aliphatic appendages, exhibit high fluidity and amphiphilic activity—hallmark properties of synthetic lipids. Using click chemistry-mediated synthetic strategies, we incorporate a diverse array of functional groups into the structures of ionic liquids, tailoring their properties for optimal performance. Our research addresses the critical need for gene therapy vectors that combine transfection efficacy with safety. Beyond gene delivery, these versatile materials show promise in various applications, including biomolecule preservation and storage, and as energetic materials. By leveraging the unique properties of lipid-like ionic liquids, we aim to overcome the limitations of traditional vectors and pave the way for more effective and safer gene therapies and vaccines. This presentation will highlight our key findings, discuss the advantages of lipid-like ionic liquids over conventional vectors, and explore the potential impact of this technology on the future of gene therapy and vaccine development.



Biography: Arsalan Mirjafari is the Dr. Richard S. Shineman Endowed Chair and Professor in Chemistry in the Chemistry Department of the State University of New York at Oswego (SUNY Oswego). His research centers on the click-enabled synthesis of novel functional ionic liquids with the overarching goal of uncovering specific molecular and materials functions. This has diverse applications, including vaccine preservation, nucleic acid delivery, lipid-like materials, battery electrolytes, and direct air capture of CO₂. Dr. Mirjafari has authored over 70 peer-reviewed contributions, including a patent on preservation of DNA in ionic liquids. He earned his Ph.D. in Organic Chemistry from University of Isfahan (Iran) in 2009 and completed postdoctoral training with Prof. Jim Davis at University of South Alabama (2010 – 2012). His research program is currently funded by the NIH the NSF, and the Shineman Foundation.

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